TROUBLESHOOTING TECHNIQUES

UNCLASSIFIED

CF351L09-

RISK ASSESSMENT: *Low*

SAFETY CONSIDERATIONS:

Electrical Shock Hazard

Electrostatic Discharge

ENVIRONMENTAL CONSIDERATIONS:

None

TERMINAL LEARNING OBJECTIVE

ACTION: Troubleshoot inserted fault in the 8086 microprocessor.

CONDITIONS: Given a classroom environment, Computer Aided Instruction (CAI) workstation, NIDA electronic trainer, logic probe, and official OMEMS reference material.

STANDARDS: Correctly identify at least 4 of 17 malfunctions in the 8086 microprocessor.

ENABLING LEARNING OBJECTIVE

ACTION: Identify the techniques required to troubleshoot a defective microprocessor system.

CONDITIONS: Given a classroom environment, Computer Aided Instruction (CAI) workstation, NIDA electronic trainer, and official OMEMS reference material.

STANDARDS: Correctly identify at least 4 of 17 malfunctions in the 8086 microprocessor.

TROUBLESHOOTING

A METHODICAL APPROACH TO FINDING A FAULT IN A SYSTEM.

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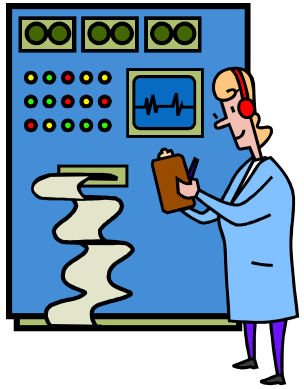
UNDERSTANDING OF EQUIPMENT AND TEST EQUIPMENT

KEEP SIGHT OF OVERALL TROUBLESHOOTING TASK



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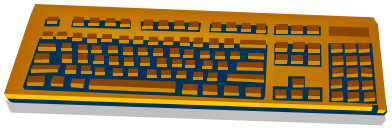
SECTIONS OF MICROPROCESSOR AND THE ROLE

-WHICH COMPONENTS ARE NECESSARY

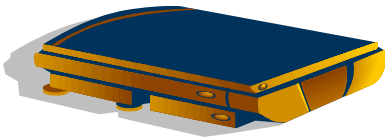
-COLD START

-CLOCK CYCLES

-MACHINE CYCLES



-KEYPAD AND DISPLAY



-PERIPHERAL DEVICES

STEPS TO TROUBLESHOOTING

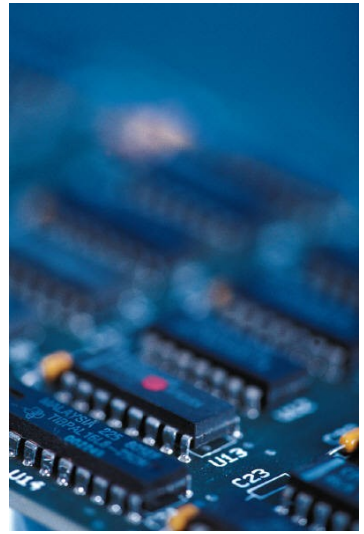
1. ANALYZE THE SYSTEM
2. RECHECK THE SETUP
3. MEASURE AND TEST THE SYSTEM
4. DOUBLE CHECK YOUR RESULTS

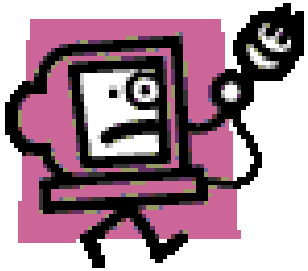
REF: Advanced Micro Manual
“Troubleshooting Section”

ANALYZE THE SYSTEM

-COMPARE OPERATIONAL CONDITION

-DETERMINE THE SYMPTOMS





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RECHECK THE SETUP

-SYSTEM AND TEST EQUIPMENT

-CALCULATIONS

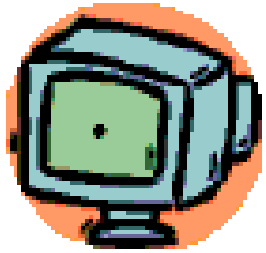
-OBVIOUS MISTAKES

MEASURE AND TEST THE SYSTEM

-FIRST ATTEMPT TO FIND THE FAULT

-USE SYMPTOMS AS A GUIDE

-USE TEST EQUIPMENT TO MEASURE



DOUBLE CHECK YOUR RESULTS

-ANALYZE THE CIRCUIT

-DETERMINE IF FAULT CAN CAUSE THE SYMPTOMS

ENABLING LEARNING OBJECTIVE

ACTION: Identify the procedures and precautions used to handle a microprocessor system.

CONDITIONS: Given a classroom environment, Computer Aided Instruction (CAI) workstation, NIDA electronic trainer, digital logic probe, and official OMEMS reference material.

STANDARDS: Correctly identify at least 4 of 17 malfunctions in the 8086 microprocessor.

Environmental Consideration

IC chip manufacturers specify operational temperature ranges.

Proper grounding is also essential to the operation of the microprocessor.

Spurious emissions such as that of emissions from unshielded power supplies must be considered too.

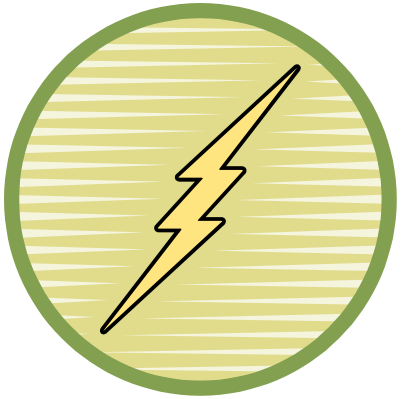
Power must be turned off before attaching or detaching hardware from the system bus and the reasons why.

COMPONENTS

-HANDLING

-STATIC CHARGE

-PHYSICAL DAMAGE



Preventive Maintenance of IC chips

1. Raising the humidity with a humidifier or plants or aquarium may reduce the chances of building a static charge.

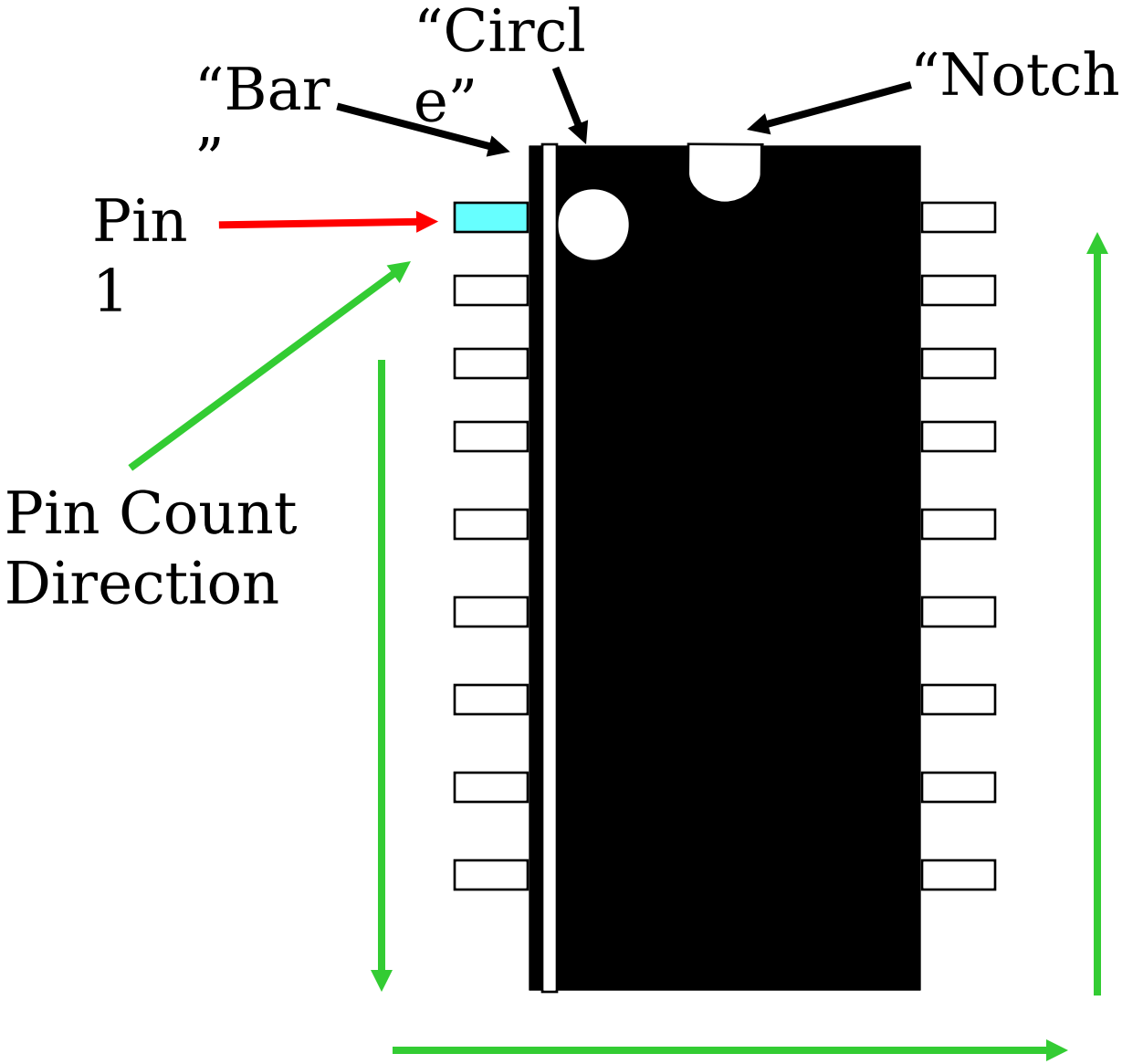
2. The use of a static free carpet can also reduce the chances of building a static charge.

3. Using a ground strapped tied to the wrist when handling IC chips.

4. Handling as few chips as possible reduces the chances of destroying the chip with a static

5. Picking a chip up by the body reduces the chances of causing damage to the internal circuits of the chip.

IC PIN 1 IDENTIFICATION



CF351L09-17

IC INSERTION AND REMOVAL

-SOLDERING CAN DESTROY AN IC

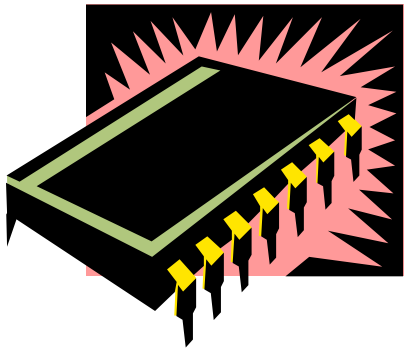
-CHECK LEGS OF IC

-VISUALLY INSPECT INSERTION

-REMOVE BY LIFTING UP

-MAY REQUIRE ROCKING

-TOOLS FOR INSERTION AND REMOVAL



ENABLING LEARNING OBJECTIVE

ACTION: Identify the basic tools used to troubleshoot microprocessor systems.

CONDITIONS: Given a classroom environment, Computer Aided Instruction (CAI) workstation, NIDA electronic trainer, digital logic probe, and official OMEMS reference material.

STANDARDS: Correctly identify at least 4 of 17 malfunctions in the 8086 microprocessor.

Troubleshooting tools

- Select the appropriate tool to perform troubleshooting.
- Specialized tools enable the repairer to locate faults more quickly.

TEST INSTRUMENTS

-COMMON TEST EQUIPMENT

-Logic Probe

-Oscilloscope

Digital circuits

- Digital circuits normally use low DC voltages.
- There is normally no AC voltage in AC circuits.
- Digital circuits normally do not require resistance checks due to IC design.
- Digital circuits often rely on timing and relationships in time.
- IC can not be repaired and that the method used to troubleshoot is to check input and output signals.

OSCILLOSCOPE

-MORE EXPENSIVE

-VISUAL DISPLAY

-AC, DC, FREQUENCY, PHASE

-DETECT ABNORMALITIES

-AMPLITUDE, RISE AND FALL TIMES

-PULSE WIDTH, PERIOD,

LOGIC PROBE

MEASURES LOGIC LEVELS

SIMPLE MEANS OF MEASURING 1 OR 0

CAN ALSO MEASURE SINGLE PULSES, MULTIPLE PULSES, AND OPENS

CF351L09-

Non-Test Instrument Tools

- Visual inspections before, during, and after troubleshooting is an important tool in finding and repairing faults.
- Diagnostic routines are to test the microprocessor circuits not checked by the monitor routine.
- Troubleshooting trees can be used to keep the repairer on track guiding the repairer to the most obvious faults.

ENABLING LEARNING OBJECTIVE

ACTION: Identify the basic tools used to troubleshoot microprocessor systems.

CONDITIONS: Given a classroom environment, Computer Aided Instruction (CAI) workstation, NIDA electronic trainer, digital logic probe, and official OMEMS reference material.

STANDARDS: Correctly identify at least 4 of 17 malfunctions in the 8086 microprocessor.

Troubleshooting Drill and Practice

- Troubleshooting is done visually and with test equipment.
- Minor faults can compound.
- Must learn how the system works and how to determine if faults exist.

Visual Assessment

- Ensure power is disconnected when needed.
- Ensure IC chips are seated properly.
- Ensure the intensity control is adjusted.
- Look for physical damage which may impair operations.

Check Power Supply

- Voltage level correct.
- Ensure the voltage is not out of range.
- Nida uses 5 volts with a 5% tolerance.

Check Display

- Ensure the correct display message is present.
- May have to check to Display Intensity.

Check Keyboard

- Each key must be pressed to determine if the keyboard is functioning properly.
- Determine if the key is a function key or a hexadecimal key.

Check Memory

- Monitor program is contained in memory.
- Test the high portion of RAM.

- Diagnostic routines will test memory more thoroughly. For example, if you need
- to check the MEMRD signal the best way to do that is to write a program that with read from memory constantly so as to give you the opportunity to check the signal while it is being used.

Check I/O Ports

- Use diagnostic routines to check I/O Ports. (Flowchart in HO has steps)
- Only check I/O ports if the keyboard and display are functioning properly.
- If keyboard and display are not functioning then I/O will not function.

Check Data Bus

- Must check each line of the data bus.
- Must compare with sample signals.

NIDA 500 TRAINER FLOWCHART

USED TO TROUBLESHOOT THE NIDA 500 TRAINER

FOLLOW THE FLOWCHART IN THE PROPER SEQUENCE

<u>WITHOUT MISSING STEPS.</u>

CF351L09-

ENABLING LEARNING OBJECTIVE

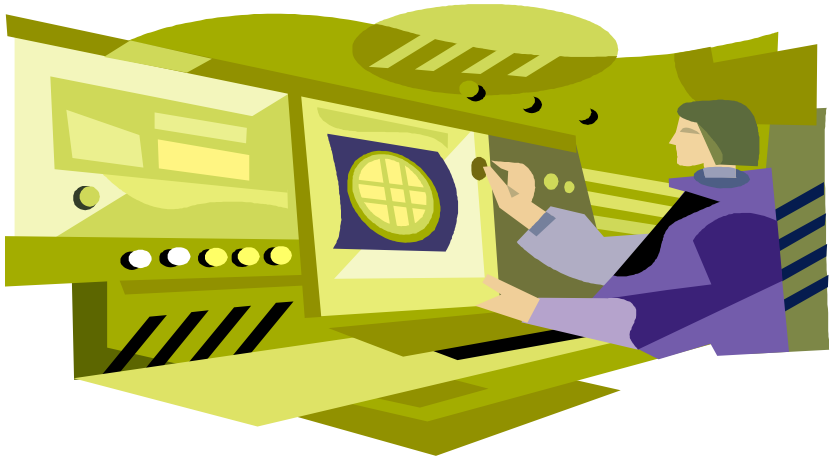
ACTION: Troubleshoot instructor inserted faults.

CONDITIONS: Given a classroom environment, Computer Aided Instruction (CAI) workstation, NIDA electronic trainer, digital logic probe, and official OMEMS reference material.

STANDARDS: Correctly identify at least 4 of 17 malfunctions in the 8086 microprocessor.

TROUBLESHOOT THE TRAINER

Use the flowchart and the normals matrix to troubleshoot and correctly identify inserted faults from the list given.



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